

# PATENT ABSTRACTS OF JAPAN

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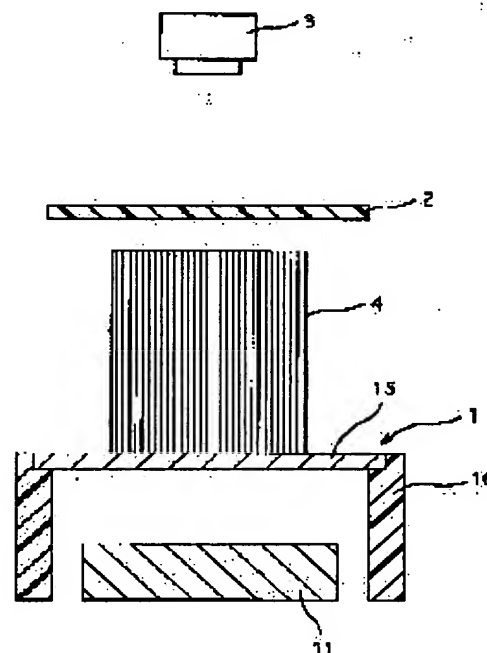
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## (54) METHOD AND DEVICE FOR INSPECTING CELL CLOGGING

### (57)Abstract:

**PROBLEM TO BE SOLVED:** To provide a method and device for inspecting cell clogging, with which a carrier having a plurality of tubular passages in the axial direction can be inspected efficiently for cell clogging.

**SOLUTION:** In the method, the carrier 4, having a plurality of tubular passages in the axial direction, is inspected for clogging by cells by passing light rays through the passages. The method includes a projecting step of projecting the light rays emitted from a luminous surface which is wider than the diametral cross section of the carrier 4 and emits the light rays at uniform luminance from its whole surface upon one end face of the carrier 4, on which one openings of the tubular passages are opened and the light rays discharged from the other openings of the passages opened on the other end face of the carrier 4, after passing through the passages upon a projection plate 2 and an image observing step of observing the image projected upon the projection plate 2. Since the light rays emitted from the luminous surface are used, the tubular passages can be inspected at once for clogging by cells, and the cost for inspection can be reduced.



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**CLAIMS**

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**[Claim(s)]**

[Claim 1] It is the inspection approach of cel plugging which this tubular path of the support which has two or more tubular paths in shaft orientations is made to pass light, and inspects cel plugging of this tubular path. While carried out opening of the light emitted from the luminescence side which emits the light of brightness with the whole surface it is larger than the cross section of the direction of a path of this support, and uniform, and one side of this tubular path of this support irradiates it at an end face. The inspection approach of cel plugging characterized by having the projection process which projects the light emitted from opening of another side of this tubular path that passed through the inside of this tubular path, and carried out opening to the other-end side of this support on a projection plate, and the image observation process which observes the projection image projected on this projection plate.

[Claim 2] The light emitted from said luminescence side is the inspection approach of cel plugging according to claim 1 irradiated all over said one end face of said support.

[Claim 3] Said luminescence side is the inspection approach of cel plugging according to claim 1 which has the light source which emits the diffused light.

[Claim 4] Said luminescence side is the inspection approach of cel plugging according to claim 3 which has said two or more light sources.

[Claim 5] Said projection plate is the inspection approach of cel plugging according to claim 1 which consists of a translucent plate.

[Claim 6] It is cel plugging test equipment which this tubular path of the support which has two or more tubular paths in shaft orientations is made to pass light, and inspects cel plugging of this tubular path. A luminescence means to have the luminescence side which emits a light of brightness uniform from the whole surface larger than the cross section of the direction of a path of this support, Cel plugging test equipment characterized by having the projection plate with which the passage light emitted from opening of another side of this tubular path that was emitted from this luminescence side, and passed through the inside of this tubular path of this support, and carried out opening to the other-end side of this support is projected.

[Claim 7] Cel plugging test equipment according to claim 6 which has an image observation means to observe said projection image projected on said projection plate.

[Claim 8] Said image observation means is cel plugging test equipment according to claim 7 which is one sort chosen from a CCD camera, a line sensor camera, and an optical camera.

[Claim 9] Cel plugging test equipment according to claim 6 which has a support maintenance means to hold this support where said tubular path of said support is extended in the perpendicular direction to the front face of this luminescence side between said luminescence sides and said projection plates.

[Claim 10] Said luminescence means is cel plugging test equipment according to claim 6 which has the light source which emits synchrotron orbital radiation.

[Claim 11] Said luminescence side is cel plugging test equipment according to claim 10 which has said two or more light sources.

[Claim 12] Said projection plate is cel plugging test equipment according to claim 6 which consists of a translucent plate.

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**DETAILED DESCRIPTION**

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention is the inspection approach of cel plugging which inspects cel plugging of support, and is the inspection approach of cel plugging which inspects in detail cel plugging of support which has a tubular path in shaft orientations.

[0002]

[Description of the Prior Art] After the exhaust gas discharged by internal combustion engines, such as an engine of an automobile, is purified using the catalyst for emission gas purification, it is discharged in atmospheric air. The support layer which consists of heat-resistant inorganic oxides, such as an alumina, etc. is usually formed in the front face of the support which consists of heat-resistant ingredients, such as ceramics, and catalyst noble metals are supporting this catalyst for emission gas purification in this support layer. Moreover, the monolith support which has many tubular paths as this support in shaft orientations aiming at making the amount of contact with the catalyst of exhaust gas increase is known.

[0003] This monolith support is formed so that it may have the cel which consists of a detailed tubular path of a large number called 200 - 10 cel / cm<sup>2</sup>. However, monolith support had the thin septum which isolates each cel which consists of many detailed tubular paths, and when breakage arose to a septum at the time of the manufacture, cel plugging had produced it.

[0004] Moreover, since the tubular path was detailed, also when forming a support layer, it was easy to produce cel plugging. That is, although the support layer is formed by adjusting the slurry which consists of heat-resistant inorganic oxides, such as an alumina, etc., carrying out the coat of this slurry to the front face of monolith support, drying it, and making it calcinate, when it becomes inadequate at the time of the coat of a slurry discharging [ of the slurry which trespassed upon the interior of a tubular path ] it, the formed support layer will plug up a cel.

[0005] When cel plugging arose in support and it is used as a catalyst for emission gas purification, the cross section of the path through which exhaust gas passes will decrease, and contact to catalyst noble metals and exhaust gas will be suppressed. Consequently, the emission-gas-purification engine performance of the catalyst for emission gas purification falls. Furthermore, discharging [ of the exhaust gas from an engine ] becomes inadequate, and it comes to reduce the engine engine performance because the cross-sectional area which exhaust gas passes decreases.

[0006] For this reason, inspection of cel plugging is performed to the monolith support which has many tubular paths.

[0007] Inspection of the conventional cel plugging was conducted by holding up support to the light source and observing the interruption fault part of light by viewing. At this time, changing to viewing and inspecting using equipments, such as a CCD camera, is also made.

[0008] Moreover, there is also the inspection approach using the laser beam as a light which passes a tubular path. The inspection approach using this laser beam is an approach of inspecting cel plugging by measuring the reinforcement of the laser beam which passed through the tubular path.

[0009] However, by the approach of observing an interruption fault part by viewing, since cel plugging was inspected by identifying passage light and a non-passed light, great time amount and cost are not only needed for inspection, but it had caused the fall of the inspection precision by the rate of area of cel plugging becoming ambiguous.

[0010] Moreover, since passage light would be caught only in the size of a camera lens when a CCD camera is used, in the part which separated from the camera lens, passage light could not be caught and decision of cel plugging in the whole support was not completed. That is, since there was a limitation also in the size of

a camera lens, the whole support was not able to be inspected.

[0011] Furthermore, since the laser beam was a beam of light which has high rectilinear-propagation nature, it becomes impossible for the laser beam to have passed through the tubular path of support, and the inspection approach using a laser beam had the problem that the whole support will be judged to be cel plugging, when the shaft of support inclined to the laser beam.

[0012]

[Problem(s) to be Solved by the Invention] This invention is made in view of the above-mentioned actual condition, and let it be a technical problem to offer the inspection approach of cel plugging which can inspect efficiently cel plugging of support which has two or more tubular paths in shaft orientations, and test equipment.

[0013]

[Means for Solving the Problem] In order to solve the above-mentioned technical problem, as a result of this invention person's etc. repeating examination about the inspection approach of cel plugging, it was the light emitted from the luminescence side, and the light which passed through the tubular path was projected on the projection plate, and it found out that the above-mentioned technical problem was solvable by considering as the inspection approach and test equipment which observe the projection image which \*\*\*\*(ed) to this projection plate.

[0014] Namely, the inspection approach of cel plugging of this invention It is the inspection approach of cel plugging which the tubular path of the support which has two or more tubular paths in shaft orientations is made to pass light, and inspects cel plugging of a tubular path. While carried out opening of the light emitted from the luminescence side which emits the light of brightness with the whole surface it is larger than the cross section of the direction of a path of support, and uniform, and one side of the tubular path of support irradiates it at an end face. It is characterized by having the projection process which projects the light emitted from opening of another side of the tubular path which passed through the inside of a tubular path and carried out opening to the other-end side of support on a projection plate, and the image observation process which observes the projection image projected on the projection plate.

[0015] The inspection approach of cel plugging of this invention is the inspection approach of inspecting cel plugging by observing the projection image which projected the passage light which the tubular path of support was made passing the light emitted from the luminescence side, and was emitted from the tubular path on the projection plate, and was obtained. Since the inspection approach of cel plugging of this invention can inspect cel plugging by observing the projection image which \*\*\*\*(ed) to the projection plate while using the light from a luminescence side, it can inspect cel plugging of two or more tubular paths at once, and can reduce the cost which inspection of cel plugging takes.

[0016] Moreover, the cel plugging test equipment of this invention is cel plugging test equipment which the tubular path of the support which has two or more tubular paths in shaft orientations is made to pass light, and inspects cel plugging of a tubular path. A luminescence means to have the luminescence side which emits a light of brightness uniform from the whole surface larger than the cross section of the direction of a path of support, It is characterized by having the projection plate with which the passage light emitted from opening of another side of the tubular path which was emitted from the luminescence side, and passed through the inside of the tubular path of support, and carried out opening to the other-end side of support is projected.

[0017] The cel plugging test equipment of this invention is having a luminescence means and a projection plate, and cel plugging can be inspected by observing the projection image which projected the light which passed through the tubular path of support on the projection plate, and \*\*\*\*(ed) it. Moreover, the cel plugging test equipment of this invention shows the effectiveness which can measure the amount of cels which it not only can inspect cel plugging of two or more tubular paths at once, but blockaded it from the projection image in order to observe the projection image which \*\*\*\*(ed) to the projection plate. Furthermore, it can become possible to perform observation of a projection image automatically, and the cost which inspection of cel plugging takes can be reduced.

[0018]

[Embodiment of the Invention] (The inspection approach) The inspection approach of cel plugging of this invention is the inspection approach of cel plugging which the tubular path of the support which has two or more tubular paths in shaft orientations is made to pass light, and inspects cel plugging of a tubular path. That is, when cel plugging arises to a tubular path, it is the inspection approach of inspecting cel plugging by measuring the passage light which passed through the tubular path of support using light being intercepted in a tubular path.

[0019] The inspection approach of cel plugging of this invention has a projection process and an image observation process.

[0020] A projection process is a process which projects the light emitted from opening of another side of the tubular path as for which irradiated the end face, passed through the inside of a tubular path, and while one side of the tubular path of support carried out opening of the light emitted from the luminescence side which emits the light of brightness with the whole surface it is larger than the cross section of the direction of a path of support, and uniform carried out opening to the other-end side of support on a projection plate.

[0021] That is, light comes to pass to the tubular path of support by irradiating the light emitted from the luminescence side which emits the light of brightness with the whole surface it is larger than the cross section of the direction of a path of support, and uniform at one end face of support.

[0022] Coincidence can be made to pass light to all tubular paths by a luminescence side being formed in detail more widely than the cross section of the direction of a path of support now. Moreover, the light irradiated by the tubular path of support will have uniform brightness because the whole surface of a luminescence side emits the light of uniform brightness, and the brightness of the light which passed support serves as homogeneity. Consequently, the brightness of the projection image projected on the projection plate becomes fixed, and observation at a subsequent observation process becomes easy.

[0023] Moreover, the projection image with which observation of cel plugging is performed \*\*\*\* by projecting the light emitted from opening of another side of the tubular path which passed through the inside of a tubular path and carried out opening to the other-end side of support on a projection plate. That is, the part on which the cel passage light which passed through the tubular path was projected is bright, and the part in which light was intercepted by cel plugging is obtained as a projection image which \*\*\*\*(ed) darkly.

[0024] An image observation process is a process which observes the projection image projected on the projection plate. That is, the inspection approach of cel plugging of this invention can detect cel plugging of support by observing a projection image in an image observation process. In detail, since a difference clear in brightness produces a projection image between the part where the passage light which passed through the tubular path was projected, and the part through which light was not able to pass by cel plugging, cel plugging can be judged by observing the difference of this brightness.

[0025] As for the light emitted from the luminescence side, it is desirable to irradiate all over one end face of support. That is, light can be irradiated by light being irradiated all over the end face of support at all the tubular paths of support. For this reason, cel plugging of all tubular paths can be inspected at once.

[0026] As for a luminescence side, it is desirable to have the light source which emits the diffused light. Here, the diffused light is a light which will be diffused if emitted from the light source, and the light which has rectilinear-propagation nature like a laser beam shows a different light. That is, by having the light source which emits the diffused light, it will progress in the direction where light emitted from a luminescence side is various, and even if it is in the condition toward which the support by which cel plugging is inspected inclined to the luminescence side, light can pass through a tubular path. As this light source, if the diffused light can be emitted, it is not limited especially and fluorescence tubing, LED, an optical fiber, and the OHP light source can be raised.

[0027] As for a luminescence side, it is desirable to have two or more light sources. That is, the brightness of the light emitted from a luminescence side becomes fixed all over a luminescence side by having two or more light sources. As for two or more light sources, at this time, it is desirable to have been allotted on the same flat surface in the dense condition. That is, the brightness of the light emitted from a luminescence side by two or more light sources being allotted on the same flat surface in the dense condition becomes homogeneity.

[0028] As for a projection plate, consisting of translucent material is desirable. Here, translucent material shows the member which can observe the light and darkness of the light on which it was projected on the surface of one side from the front face of another side. A projection image will \*\*\*\* on the front face where the passage light of a projection plate is irradiated, and a different front face, and observation of a projection image becomes easy because a projection plate consists of translucent material. That is, it becomes possible to observe a projection image from a perpendicular direction to a projection image, and inspection precision improves.

[0029] Especially as such translucent material, it is not limited and \*\*\*\* glass, a resin plate, etc. can be raised.

[0030] Moreover, as for a projection plate, consisting of a tele cent rucksack lens is desirable. Here, a tele cent rucksack lens is a lens which makes only concurrency light penetrate. Moreover, when using a tele cent

rucksack lens, holding so that support may not incline is desirable. That is, when support inclines, it is because it becomes impossible to penetrate the tele cent rucksack lens which makes only concurrency light penetrate and a projection image is no longer obtained.

[0031] As for a projection plate, it is desirable that the front face where passage light is irradiated is allotted in the condition parallel to a luminescence side. That is, by being allotted to a luminescence side and parallel, the distance of a luminescence side and a projection plate becomes fixed, and a projection plate becomes fixed [ the brightness of the passage light describing the projection image projected on a projection plate ]. The judgment of cel plugging becomes easy because brightness becomes fixed. Furthermore, after the projection plate has inclined to a luminescence side, when it is arranged, it is because distortion will arise in a projection image and inspection of cel plugging becomes inaccurate.

[0032] It is desirable that observation of a projection image is performed by the image observation means chosen from a CCD camera, a line sensor camera, and an optical camera. That is, inspection of cel plugging can be automatically conducted by observing a projection image with an image observation means. Furthermore, detection of the cel blockaded with the operation means can be continuously performed automatically by connecting an image observation means to operation means, such as a computer.

[0033] The inspection approach of cel plugging of this invention is the inspection approach of inspecting cel plugging by observing the projection image which was made projecting the passage light which the tubular path of support was made passing the light emitted from the luminescence side, and passed through the tubular path of support on a projection plate, and \*\*\*\*(ed) it. Since the inspection approach of cel plugging of this invention can inspect cel plugging by observing the projection image which \*\*\*\*(ed) to the projection plate while using the light from a luminescence side, it can inspect cel plugging of two or more tubular paths at once, and can reduce the cost which inspection of cel plugging takes.

[0034] (Cel plugging test equipment) The cel plugging test equipment of this invention has a luminescence means and a projection plate.

[0035] A luminescence means has the luminescence side which emits a light of brightness uniform from the whole surface larger than the cross section of the direction of a path of support. Namely, light can be irradiated now at two or more tubular paths at coincidence because a luminescence means consists of the surface light source. Moreover, since the light emitted from the surface light source is the light of uniform brightness, the light irradiated by the tubular path of support will have uniform brightness, and the brightness of the light which passed support serves as homogeneity. Consequently, if cel plugging arises to a tubular path, the brightness of passage light will decrease and cel plugging of support can be inspected by measuring brightness.

[0036] A projection plate is a member on which the passage light emitted from opening of another side of the tubular path which was emitted from the luminescence side, and passed through the inside of the tubular path of support, and carried out opening to the other-end side of support is projected. That is, the cel passage light which passed through the tubular path, and a non-passed light by cel plugging are obtained as a projection image. Here, since a difference with cel passage light and a non-passed light clear in brightness arises, cel plugging can be judged easily.

[0037] It is desirable to have an image observation means to observe the projection image projected on the projection plate. That is, by having an image observation means, a projection image can be observed with an image observation means, and inspection of cel plugging can be conducted automatically. Furthermore, detection of the cel blockaded with the operation means can be continuously performed automatically by connecting an image observation means to operation means, such as a computer. It is desirable that it is one sort chosen from a CCD camera, a line sensor camera, and an optical camera as such an image observation means.

[0038] It is desirable to have a support maintenance means to hold support where a before [ support ]-like path is extended in the perpendicular direction to the front face of a luminescence side between a luminescence side and a projection plate. That is, the brightness of the projection image with which the wavelength of the passage light emitted from support was projected on the set and the projection plate by holding support in the perpendicular direction to the front face of a luminescence side is stabilized. Consequently, decision of cel plugging becomes easy.

[0039] As for a luminescence means, it is desirable to have the light source which emits the diffused light. Here, the diffused light is a light which will be diffused if emitted from the light source, and the light which has rectilinear-propagation nature like a laser beam shows a different light. That is, by having the light source to which a luminescence means emits the diffused light, it will progress in the direction where light emitted from a luminescence side is various, and even if it is in the condition toward which the support by

which cel plugging is inspected inclined to the luminescence side, light can pass through a tubular path. As this light source, if the diffused light can be emitted, it is not limited especially and fluorescence tubing, LED, an optical fiber, and the OHP light source can be raised.

[0040] As for a luminescence side, it is desirable to have two or more light sources. That is, the brightness of the light emitted from a luminescence side becomes fixed all over a luminescence side by having two or more light sources. As for two or more light sources, at this time, it is desirable to have been allotted on the same flat surface in the dense condition. That is, the brightness of the light emitted from a luminescence side by two or more light sources being allotted on the same flat surface in the dense condition becomes homogeneity.

[0041] As for a projection plate, consisting of translucent material is desirable. Here, translucent material shows the member which can observe the light and darkness of the light on which it was projected on the surface of one side from the front face of another side. That is, a projection image comes to \*\*\*\* at the rear face of the front face where the passage light of a projection plate is irradiated, and observation of a projection image becomes easy because a projection plate consists of translucent material. That is, it becomes possible to observe a projection image from a perpendicular direction to a projection image, and inspection precision improves.

[0042] Especially as such translucent material, it is not limited and \*\*\*\* glass, a resin plate, etc. can be raised.

[0043] Moreover, as for a projection plate, consisting of a tele cent rucksack lens is desirable. Here, a tele cent rucksack lens is a lens which makes only concurrency light penetrate. In addition, when using a tele cent rucksack lens, holding so that support may not incline is desirable. That is, when support inclines, it is because it becomes impossible to penetrate the tele cent rucksack lens which makes only concurrency light penetrate and a projection image is no longer obtained.

[0044] As for a projection plate, it is desirable that the front face where passage light is irradiated is allotted in the condition parallel to a luminescence side. That is, by being allotted to a luminescence side and parallel, the distance of a luminescence side and a projection plate becomes fixed, and a projection plate becomes fixed [ the brightness of the passage light describing the projection image projected on a projection plate ]. The judgment of cel plugging becomes easy because brightness becomes fixed. Furthermore, after the projection plate has inclined to a luminescence side, when it is arranged, it is because distortion will arise in a projection image and inspection of cel plugging becomes inaccurate.

[0045] As for a projection plate, it is desirable to be allotted to the other-end side of support and the location which approached. That is, it is because it is the light emitted from the other end, interference is mutually produced when the light emitted from the adjoining tubular path diffuses, and it becomes a not clear projection image because the distance of a projection plate and the other-end side of support opens.

[0046] As for a projection plate, it is desirable to be allotted in contact with the other-end side of support. That is, it is suppressed that the light from the outside other than the light which passed through the tubular path is projected on a projection plate by a projection plate being arranged in contact with the end face of support. Consequently, a clear projection image comes to be obtained.

[0047] The cel plugging test equipment of this invention is having a luminescence means and a projection plate, and cel plugging can be inspected by observing the projection image which made the transmitted light which passed the inside of the tubular path of support project on a projection plate. For this reason, it is test equipment which can inspect cel plugging efficiently.

[0048] The inspection approach of cel plugging of this invention and especially cel plugging test equipment are useful for using for inspection of the catalyst for emission gas purification of an automobile.

[0049]

[Example] Hereafter, this invention is explained using an example.

[0050] (Example) Cel plugging test equipment was created as an example of this invention. The sectional view was shown in drawing 1 so that the configuration of this cel plugging test equipment might be known.

[0051] (Cel plugging test equipment) The cel plugging test equipment of an example is equipment which has the light source section 1, the projection plate 2, and the image sensor 3.

[0052] the case 16 in which the light source 11 which irradiates the light in which the light source section 1 advances toward the vertical upper part at least, the transparence plate 15 arranged above the light source 11, and the transparence plate 15 formed on top [ a part of ], and held the light source 11 in the interior -- since -- it is constituted. In addition, in the cel plugging test equipment of this example, although the transparence plate 15 is used for the light source section 1, the translucent plate which can make light penetrate may be used instead of the transparence plate 15.

[0053] The light source 11 has the fluorescence tubing 111 of 10W of the shape of two or more straight pipe which is in an parallel condition mutually and has been arranged without a crevice on the same horizontal plane. In addition, the light source 11 which has this fluorescence tubing 111 has equipment (not shown) for performing lighting of the fluorescence tubing 111, such as a switch and a power source, and putting out lights. The light source 11 which consists of this fluorescence tubing was shown in drawing 2.

[0054] By the transparence plate 15 having been arranged above the light source 11, the light emitted from the light source 11 penetrates the transparence plate 15, is emitted from the top face of the light source section 1, and can irradiate the inferior surface of tongue of support. Moreover, the support which has a tubular path in the shaft orientations inspected can be laid on the front face of the transparence plate 15.

[0055] The transparence plate 15 formed on top [ a part of ], and the case 16 has held the light source 11 in the interior. That is, the case 16 holds the transparence plate 15 to the upper position of the light source 11.

[0056] The projection plate 2 is in a condition parallel to the front face of the transparence plate 15, and consists of \*\*\*\* glass arranged above the light source section 1. In addition, the projection plate 2 can set up the distance between the transparence plates 15 freely with a driving gear (not shown). Moreover, a projection image is obtained by the light projected on the light source section 1 of the projection plate 2, and the inferior surface of tongue which counters because the projection plate 2 consists of \*\*\*\* glass on the top face.

[0057] the KEYENCE make in which the image sensor 3 has a CCD camera and an arithmetic unit -- it consists of image sensor valve flow coefficient-700.

[0058] A CCD camera is arranged in the location which separated spacing on the top face of the projection plate 2, and photos the projection image which \*\*\*\*(ed) on the top face of the projection plate 2. In addition, a CCD camera can photo the whole projection image.

[0059] An arithmetic unit is equipment which detects the cel blockaded from the projection image which was electrically connected with the CCD camera and was photoed by the CCD camera. Moreover, an arithmetic unit computes the rate of area of cel plugging from the detected cel which was blockaded.

[0060] (The inspection approach of cel plugging) Below, the inspection approach of cel plugging of the cel plugging test equipment shown in drawing 1 is explained using monolith support.

[0061] In addition, the monolith support by which the inspected monolith support is used for the catalyst for emission gas purification for cars was used. In addition, the cross section of the support in which this monolith support has a tubular path is [ 2 and a tubular path ] the support in which 62 cels / cm<sup>2</sup>, and the complete product of support have the rate of cel plugging which is 3 1300cm and is 3.20% 80cm.

[0062] This rate of cel plugging was performed by counting the blockaded tubular path by viewing, the number of lock out cels of 159 was observed, and 3.20% was obtained by count.

[0063] First, in contact with the transparence plate 15, the tubular path has arranged [ one end face ] the monolith support 4 on the transparence plate 15 of the light source section 1 in the perpendicular condition to the front face of the transparence plate 15. At this time, it is desirable to fix on the transparence plate 15 with a fastener. In addition, in this example, the monolith support 4 has been arranged, where the transparence plate 15 is contacted, but if the monolith support 4 is fully fixable, the monolith support 4 does not need to be in contact with the transparence plate 15.

[0064] Continued, the light source 11 was made to emit light, and the light which penetrated the transparence plate 15 was irradiated at the end face of monolith support. The light irradiated by the end face of monolith support passes through the inside of a tubular path from opening of the tubular path which carried out opening to the end face, and is emitted to the vertical upper part from opening which carried out opening to the end face of the other end.

[0065] The light emitted from the end face of the other end is irradiated by the inferior surface of tongue of the projection plate 2. The projection plate 2 made the light irradiated by the inferior surface of tongue penetrate in the thickness direction of the projection plate 2, and the top face of the projection plate 2 was made to \*\*\*\* it as a projection image. The part by which the light emitted from the tubular path where cel plugging has not produced the projection image which \*\*\*\*(ed) to the projection plate 2 was irradiated is bright, and since light cannot pass, the tubular path which cel plugging has produced is dark.

[0066] Here, when the projection image which \*\*\*\*(ed) on the top face of the projection plate 2 was checked by viewing, the check of light and darkness was fully performed [ the projection plate 2 ] for the distance from the end face of the other end of support at the time of the distance for 20mm.

[0067] It continued and the projection plate 2 was held in the condition that the distance from the other-end side of the monolith support 4 is 5mm, and while photoing the projection image which \*\*\*\*(ed) on the top face of the projection plate 2 by the image sensor 3, the rate of area of cel plugging was computed by the

arithmetic unit having performed the image processing.

[0068] When the rate of area of cel plugging was measured from the light and darkness of a projection image by the image sensor 3, the rate of area of cel plugging was 3.31%. the rate of cel plugging with this actual monolith support -- 3.20% -- it is -- the cel plugging test equipment of an example -- it was and the rate of cel plugging has been detected in a high precision of 5% or less.

[0069] (Example of a comparison) As an example of a comparison, where the projection plate 2 is removed, cel plugging was inspected using the cel plugging test equipment of drawing 1 . At this time, spacing of the monolith support 4 and the CCD camera of an image sensor was 450mm.

[0070] The rate of area of cel plugging measured where the projection plate 2 is removed is 56.8%, and it is clear that its inspection of cel plugging has not been performed. That is, it can consent as the thing which the passage light which passed through the tubular path of monolith support, and the light which passed the periphery of monolith support produced interference mutually, and made produce gross errors.

[0071] As a deformation gestalt of the cel plugging test equipment of an example, it is good also considering the light source 11 as the LED light source 12 and the optical-fiber light source 13.

[0072] For example, the LED light source 12 is the light source which allotted LED121 on the same flat surface at intervals of 5mm. This LED light source 12 was shown in drawing 3 .

[0073] Moreover, the optical-fiber light source 13 is the light source which has arranged the edge 131 where light is emitted, using the optical fiber whose diameter is 1mm at intervals of 5mm on the same flat surface. Moreover, the other-end section of an optical fiber has countered the emitter. This optical-fiber light source 13 was shown in drawing 4 .

[0074] In addition, cel plugging of the same monolith support as an example was inspected using this LED light source 12 and the optical-fiber light source 13. The measurement result was 3.22% when the LED light source 12 was used, and it was 3.23% using up the optical-fiber light source 13.

[0075] That is, the precision of cel plugging inspection is improving from the inspection using the light source 11 which has the fluorescence tubing 111. As for this [ both ], the LED light source 12 and the optical-fiber light source 13 are considered because the brightness of the light which it is that spacing of the edge 131 where the light of LED121 and an optical fiber is emitted is short compared with spacing of 5mm and the fluorescence tubing 111, and is irradiated by monolith support became homogeneity.

[0076] Moreover, when cel plugging was inspected as another deformation gestalt as a plate which consists the projection plate 2 of acrylic resin, the measurement result was able to inspect cel plugging in 3% or less of high inspection precision. In addition, the acrylic resin plate was the white or the red plate whose thickness is 1mm. In addition, thickness may use a white vinyl chloride plate 1mm or less instead of an acrylic resin plate.

[0077] The light emitted from the light source section 1 passes through the tubular path of support 4, the projection plate 2 is made to \*\*\*\* a projection image, and the cel plugging test equipment of an example is photoing this projection image by the image sensor 3, and can inspect cel plugging of the monolith support 4. The cel plugging test equipment of an example can inspect efficiently cel plugging of support which has two or more tubular paths.

[0078]

[Effect of the Invention] The inspection approach of cel plugging of this invention is the inspection approach of inspecting cel plugging by observing the projection image which projected the passage light which the tubular path of support was made passing the light emitted from the luminescence side, and passed through the inside of the tubular path of support on the projection plate, and \*\*\*\*(ed) it. Since the inspection approach of cel plugging of this invention can inspect cel plugging by observing the projection image which \*\*\*\*(ed) to the projection plate while using the light from a luminescence side, it can inspect cel plugging of two or more tubular paths at once, and can reduce the cost which inspection of cel plugging takes.

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[Translation done.]

\* NOTICES \*

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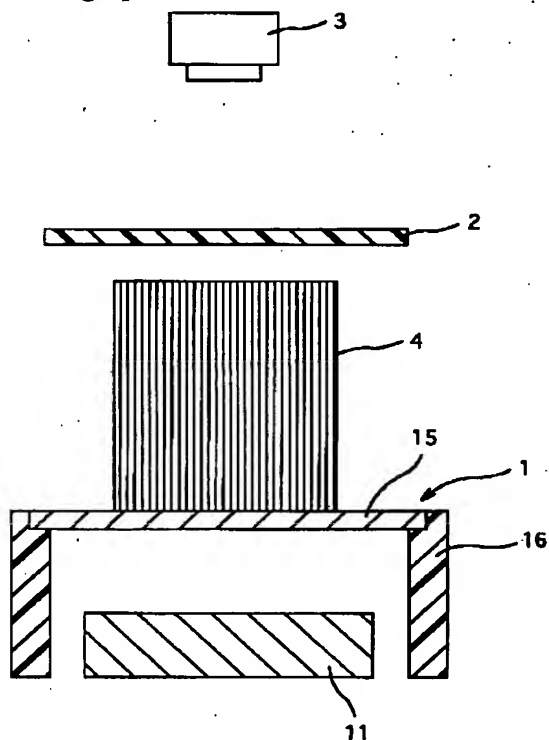
1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

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DRAWINGS

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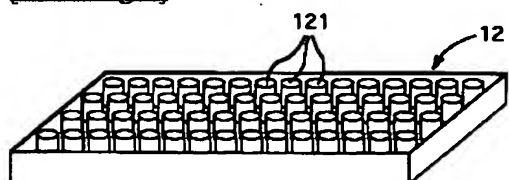
[Drawing 1]



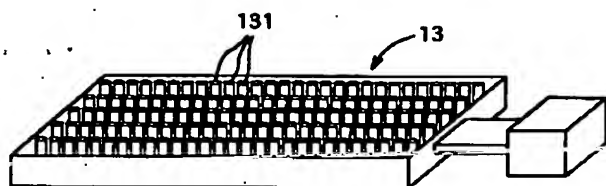
[Drawing 2]



[Drawing 3]



[Drawing 4]



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[Translation done.]